

Tri-Agency Forecast Discussion for August 28, 2010

Created 1600 UTC August 28, 2010

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Summary:

Operations are very active right now for the tri-agency coordination. Two NASA aircraft are flying today; the Global Hawk is flying over weakening Tropical Depression Frank in the East Pacific and the DC-8 is ferrying to St. Croix. It will fly two consecutive flights into Tropical Storm Earl, which could become a hurricane sometime today, in conjunction with G-IV and P3 flights by HRD into this system. Earl is expected to intensify during the investigation time frame and while Earl's forecasted track will take it very close to St. Croix, it appears likely that GRIP will only get two flights into the system before needing to land back in Ft. Lauderdale. The WB57 will deploy to Tampa on Tuesday and would fly Earl on Tuesday or Wednesday as the storm moves toward the Bahamas and recurves up the east coast of the US, and ideally wants 3 flights on 3 consecutive days. HRD will continue operations out of Barbados for the near future in conjunction with the NSF PREDICT team. PREDICT plans to fly PGI-36L on Monday, Tuesday and possibly Wednesday. HRD is also interested in flying PGI-36L with the G-IV on Monday unless otherwise tasked by the NHC. Elsewhere, Danielle is forecast to weaken as it continues to move northeast in the Atlantic over colder SSTs and into higher shear, and there is also an exposed surface cyclonic swirl in the low levels of the northern Gulf of Mexico off the LA coast. Convection with that system is confined to northeast of the center, and the NHC currently lists this as having a low probability of formation.

Forecast for 1600 UTC 8/28/2010:

Synoptic Overview:

There are five synoptic areas of interest for the GRIP field program today, four in the Atlantic (**1**) and one in the East Pacific (**6A**). From west to east, there is weakening Tropical Storm Frank (**6B**), a stationary front in the northwestern Gulf of Mexico that is triggering convection (**8, 9**), Hurricane Danielle (**11**), Tropical Storm Earl (**13**), and AL97/PGI-36L (**17**).

Tropical Storm Frank is steadily weakening and currently located near 20.3N/112.4W (**6A**). With its continued trek (**7A**) over cooler waters (**7B**) and moderate wind shear, the storm is expected to dissipate within 24 hours. The stationary front in the Gulf of Mexico (**8**) has been there for the past several days and continues to trigger convection there (**9A,B,C**). There is now a discernable low level circulation analyzed at 29N/92W, but the main burst of convection is offset to the east of it (**9B**). Hurricane Danielle is located at 29.1N/60.9W (**1, 11**) and continues to look impressive this morning, although it is down from its peak intensity of category 4 it attained yesterday. Tropical Storm Earl is located at 15.8N/51.2W (**13**) and has strengthened a bit from yesterday and is forecast to continue to intensify. AL97/PGI-36L is located near 12.5N/29W (**17**) and has broad cyclonic flow and some deep convection associated with it.

The subtropical ridge has weakened a bit and its influence currently extends from roughly 40W to 58W. Danielle and Earl are currently being steered by the subtropical high, with Danielle rounding the western side and Earl along the southern side of it. At the upper-levels, there is an anti-cyclone located over Danielle and broad anti-cyclonic curvature over Earl (**3A, 5B**). Also, a weak upper-level low was analyzed at 22N/71W.

Features of Interest:

Tropical Depression Frank:

Just before 8am EDT this morning Frank maintained tropical storm status but was moving NNE (**7A**) at 4kts into SSTs under 26 C (**7B**). The slow storm motion was attributed to an amplifying trough over the California coast suppressing Frank's northward movement. By the 8am NHC update, Frank was downgraded to a depression and is now a remnant low. The coldest horizontally polarized brightness temperatures currently seen from the CIMSS MIMIC product are around 240 K. The past 12 hr of Vaisala lightning data indicates that Frank contained only ~10-15 outer rainband strikes this morning. Convection from all sources appears to be quickly weakening (**6A, 6B**). Wind speed should decrease to 20 kts by Sunday morning after which the low will likely dissipate or be absorbed in the synoptic scale flow (**7A**).

Gulf of Mexico Feature:

A north-south oriented stationary front exists in the northern Gulf of Mexico, south of Texas and Louisiana (**8**). Northerly winds to the west are bringing in dry air (noted in water vapor imagery **9C**) while showers and thunderstorms are present to the east (**9B**). This area of convection was mentioned in the previous forecast discussion as an unlikely developer due to its proximity to the LA coast. The New Orleans weather service Doppler is observing scattered radar echoes up to 55 dBZ near the land-sea boundary. As seen in the visible imagery (**9A**), the system is not well organized though it contains moderate 850 hPa vorticity values (**5A**) and surface cyclonic winds (**3B**). Cyclonic vorticity maxima are present at both surface and mid-levels (**8, 5A**) but the system does not have cyclonic vorticity aloft (**5B**). Development is unlikely as a surface high pressure system in the east-central U.S. will bring the convection northward into LA-MS. The 24 hr GFS forecast (**10**) predicts the low to become absorbed in the southerly synoptic scale flow by Sunday morning.

Hurricane Danielle/PGI-31L:

As of 1500 UTC Hurricane Danielle is a classic pinhole-eye category 2 hurricane (**11**). Danielle is located at 29.3N/60.5W with an intensity of 95 kt, on a NNE heading at 12 kts (**1**). Danielle has had a very impressive looking outflow (**11**) for the last two days and a good upper level anticyclone is established (**3A**). However, Danielle will be interacting with a frontal zone moving off of the US East coast which will increase Danielle's forward speed and begin to push Danielle to the NE. Danielle will also begin to weaken as it interacts with this baroclinic trough, as well as moving over less favorable SSTs and the shear should be dramatically increasing out 24 hours and beyond. The SHIPS 1200 UTC forecast following the official track predicts that the shear will jump from around 15kts at 18 hours to around 32 kts by 24 hours, and will continue to be strong after that, contributing to the storm's weakening. Meanwhile SSTs will be growing less and less favorable for sustaining the storm with time. Today around Earl, the upper level outflow

from Danielle has been disrupting Earl's upper level environment, producing the dipole-like convection around Earl's exposed center today around 1600 UTC (**13**). As Danielle moves further away from Earl, this interaction will cease and provide a more favorable upper level environment for Earl's expected intensification (**12**).

The official forecast track and intensity for Danielle provided by the NHC 11am AST update August 28, 2010:

INITIAL	28/1500Z	29.3N	60.5W	95 KT
12HR VT	29/0000Z	31.2N	59.5W	95 KT
24HR VT	29/1200Z	34.6N	57.2W	90 KT
36HR VT	30/0000Z	37.7N	54.9W	85 KT
48HR VT	30/1200Z	39.5N	53.0W	75 KT
72HR VT	31/1200Z	42.5N	42.5W	70 KT
96HR VT	01/1200Z	51.0N	30.5W	65 KT...POST-TROP/EXTRATROP
120HR VT	02/1200Z	55.0N	35.5W	55 KT...POST-TROP/EXTRATROP

Tropical Storm Earl:

At 1600 UTC today, TS Earl was located at 51.8W/16.0N and moving west at 18 kts. The maximum sustained winds estimated by Dvorak techniques were 50 kts and have been slowly increasing over the last 24 hours. Visible imagery shows that there are two distinct "pods" of convection within Earl (**13**). The primary pod is centered near the analyzed center of circulation while another pod exists around 200km east of this. Cloud tops have been near -70 C in both pods. Visible imagery shows that the low level circulation became exposed near 1545 UTC and is moving separately from the main convectively activity centers (See GOES visible floater over Earl valid at 1545 UTC on 8/28, **13**). This behavior is likely due to a complicated shear environment. The outflow from Hurricane Danielle is currently over Earl and causing moderate values of deep shear near 12-15 kts (**4A**). The shear is primarily northerly now but is turning northeasterly over the eastern convective pod (See CIMSS multi-product 8 km view with track, GOES IR, and deep shear, **4B**). This geometry is acting to force the convection apart. The central storm environment is very moist, with values of Total Precipitable Water greater than 70 mm (See AMSU TPW 6 hr composite valid 0800 UTC, **2A**). Additionally, Sea Surface Temperatures beneath Earl are between 29 and 30 C. The main limiting environmental factor to Earl's development is therefore the shearing due to Danielle's outflow. NCEP ensemble forecasts expect the shear over Earl to decrease somewhat, but never remain much below 20 kt. Despite the moderate values of deep shear, model forecasts initialized at 1200 UTC today still expect Earl to intensify slowly, and become a category 1 hurricane in the next 24 - 48 hours. Some of the more aggressive forecasts have Earl as a major hurricane by 96 hours, or 1200 UTC on Wednesday (See model intensity guidance from 1200 UTC on 8/28, **14A**). The expected track of Earl took a major southward dive after Danielle became a major hurricane on the night of 8/26. Currently, tropical storm watches are out for a few of the Lesser Antilles including Anguilla, St Kitts and Antigua and Barbuda. The US Virgin Islands and Puerto Rico are expected to be just outside of the path of the storm (See NHC track and uncertainty cone issued at 1100 EDT on 8/28, **14B**).

The following are the Minimum Sea Level Pressure locations forecasted by the GFS model initialized at 1200 UTC on 8/28:

8/28 @ 1200 UTC: 51W/16N; 8/29 @ 0000 UTC: 54W/17N; 8/29 @ 1200 UTC: 58W/17.5N; 8/30 @ 0000 UTC: 59.5W/19N; 8/30 @ 1200 UTC: 61W/19N; 8/31 @ 0000 UTC: 62W/19.5N; 8/31 @ 1200 UTC: 65W/21N; 9/1 @ 0000 UTC: 67W/22N; 9/1 @ 1200 UTC: 70W, 24.5N.

The following are the Minimum Sea Level Pressure locations forecasted by the ECMWF model initialized at 0000 UTC on 8/29:

8/28 @ 0000 UTC: 48W/16N; 8/29 @ 0000 UTC: 55W/17N; 8/30 @ 0000 UTC: 59.5W/19N; 8/31 @ 0000 UTC: 62W/22N; 9/1 @ 0000 UTC: 65W/27N; 9/2 @ 0000 UTC: 70W/33N;

Dust and Dry Air in the Atlantic Basin

The CIMSS analysis shows widespread SAL air in the eastern Atlantic bounded by the coast of Africa, 40W, and north of 17N, with a narrow band of SAL air extending westward to about 50W (**2B**). TPW analysis also shows dry air on the northern and western periphery of Tropical Storm Earl (**2A**). Dry air surrounds Danielle on all sides, but does not appear to be impeding on the center of the storm. The MODIS AOT data (**15**) and GEOS-5 shows dust continuing to wrap around Earl with some of that dust breaking off and entering the eastern Caribbean Sea briefly before dissipating. It also depicts another dust outbreak off the coast of Africa within 24 hours (**16A**) and takes it westward over the central Atlantic by 72 hours (**16B**). Dry air is in close enough proximity to the north of PGI-36L that if the storm were to deepen in the short-term, some of that dry air could wrap around the western side of the wave.

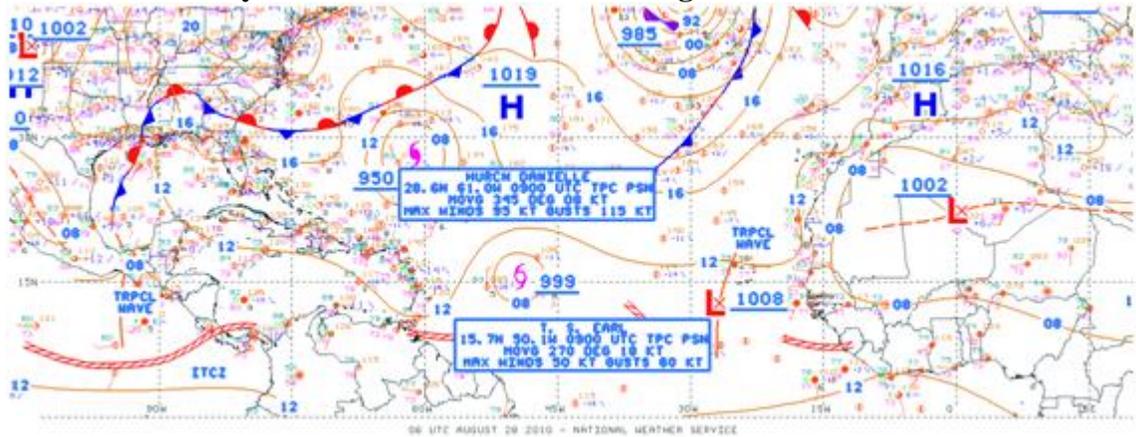
AL97/PGI-36L:

The center of the surface low pressure associated with AL97 is located near 13N/27W (**1**). Visible satellite imagery of this system (**17**) shows a broad cyclonic rotation with two distinct regions of convective activity. The convective activity in the first cluster of thunderstorms, located at 13-15N, 30-32W, seems to have increased during the past few hours. The other band of thunderstorms to the SW of the invest is oriented east-west along 10N latitude. AL97 is embedded in a fairly moist environment, with most of the dry air remaining well to the north of the system (**2A**). The invest is in a region of warm SSTs (~28°C) (**18**) and low vertical wind shear of about 10 knots (**19**) based on the CIMSS analysis.

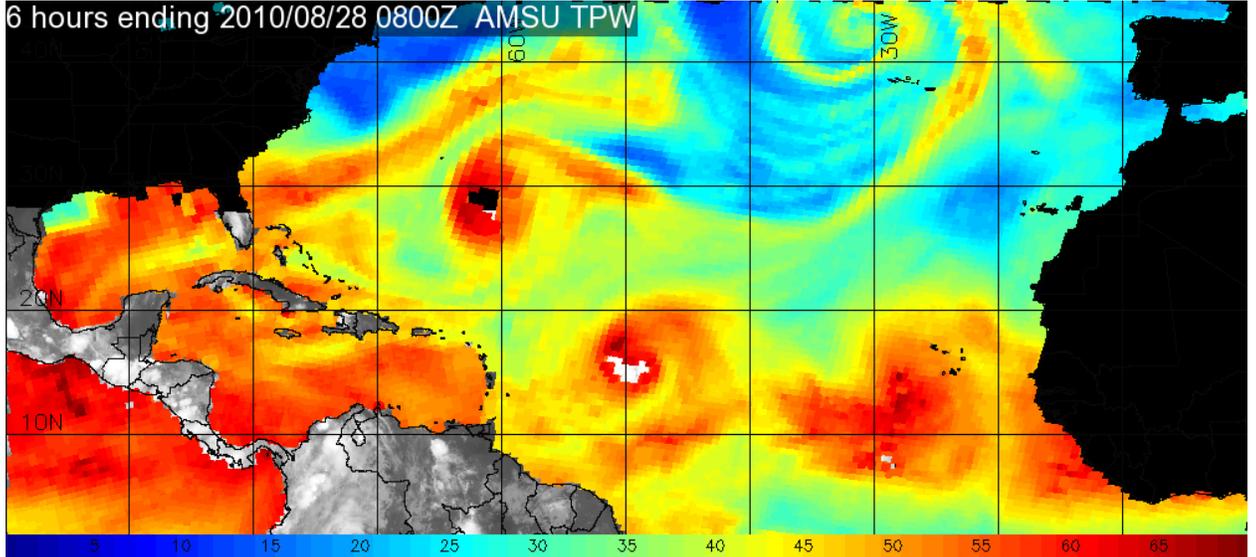
Model guidance (**20A**) takes the system towards the WNW during the next 72 h, along the southern periphery of the ridge over the eastern Atlantic. This general track keeps the invest in a region of warm SSTs (28-29°C) for the next few days (**18**). These warm SSTs, combined with the low wind shear ahead of the system, will contribute to a favorable environment for TC development in the near future. The ECMWF continues to be more aggressive than the GFS in developing the system, as can be seen by comparing the ECMWF and GFS pouch time series (**21**). However, both models suggest that abundant moisture and relatively low wind shear should create a favorable environment for AL97 development over the next couple of days. In terms of intensity, model guidance indicates that AL97 should develop into Tropical Storm Fiona within the next 48 hours (**20B**). There is more spread in the intensity guidance after this point, although most of the models suggest that hurricane development is possible by day four or five.

Images used in discussion:

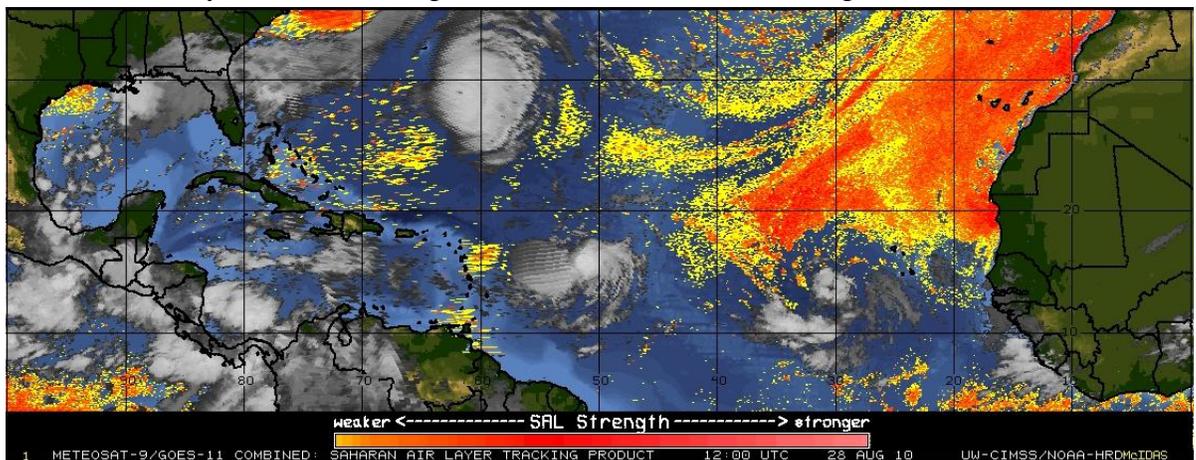
1) OPC surface analysis valid at 0600 UTC on 28 August 2010



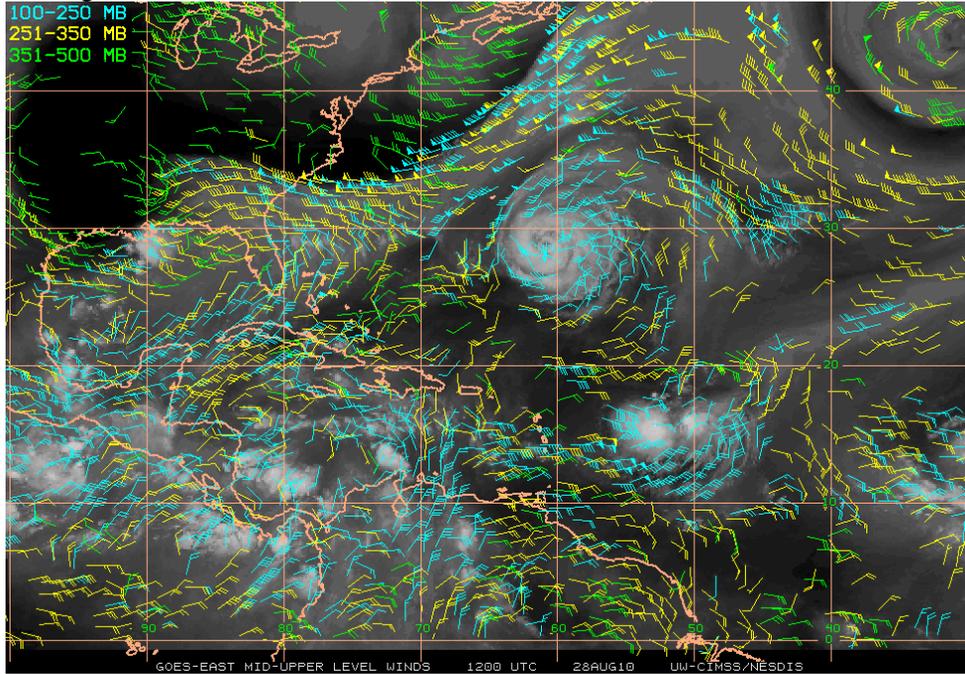
2) A) TPW for the Atlantic Basin for 6 hours ending 0800 UTC Aug 28, 2010:



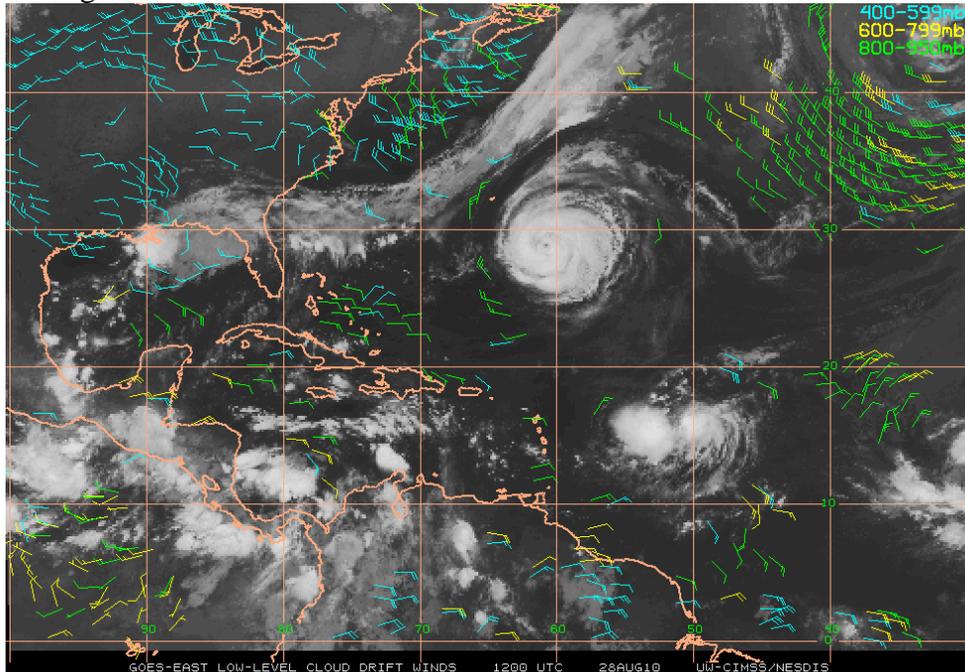
B) CIMSS analysis of SAL strength valid at 1200 UTC on 28 August 2010



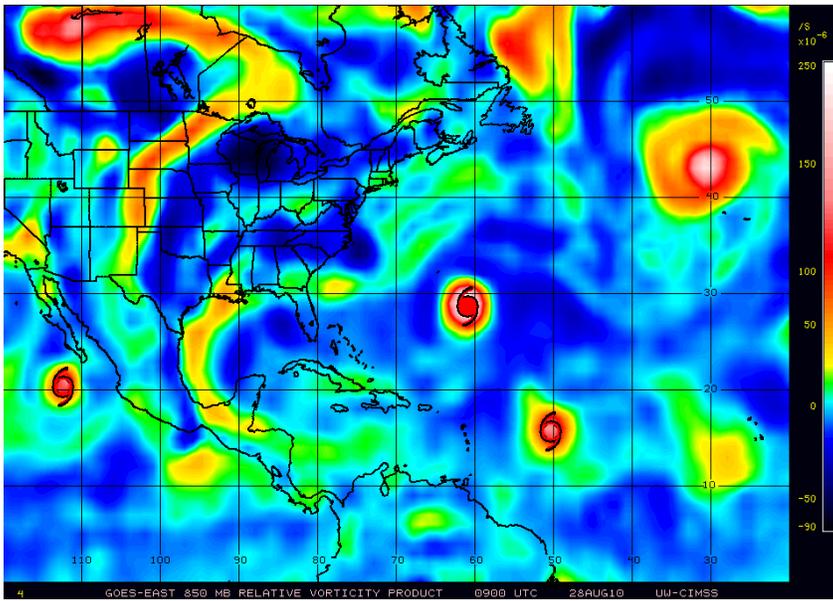
- 3) CIMSS analysis of mid-upper level winds and water vapor imagery valid at 1200 UTC on 28 August 2010



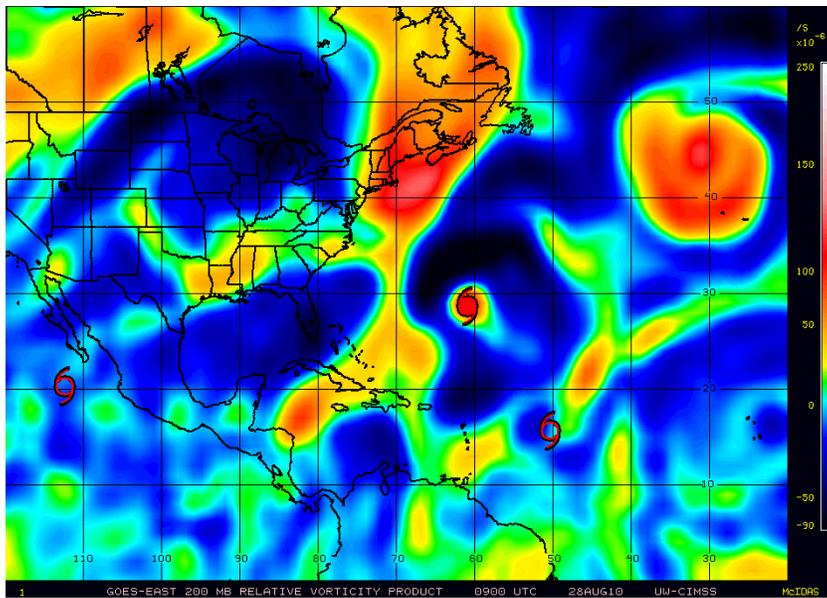
- B) CIMSS analysis of lower level winds and water vapor imagery valid at 1200 UTC on 28 August 2010



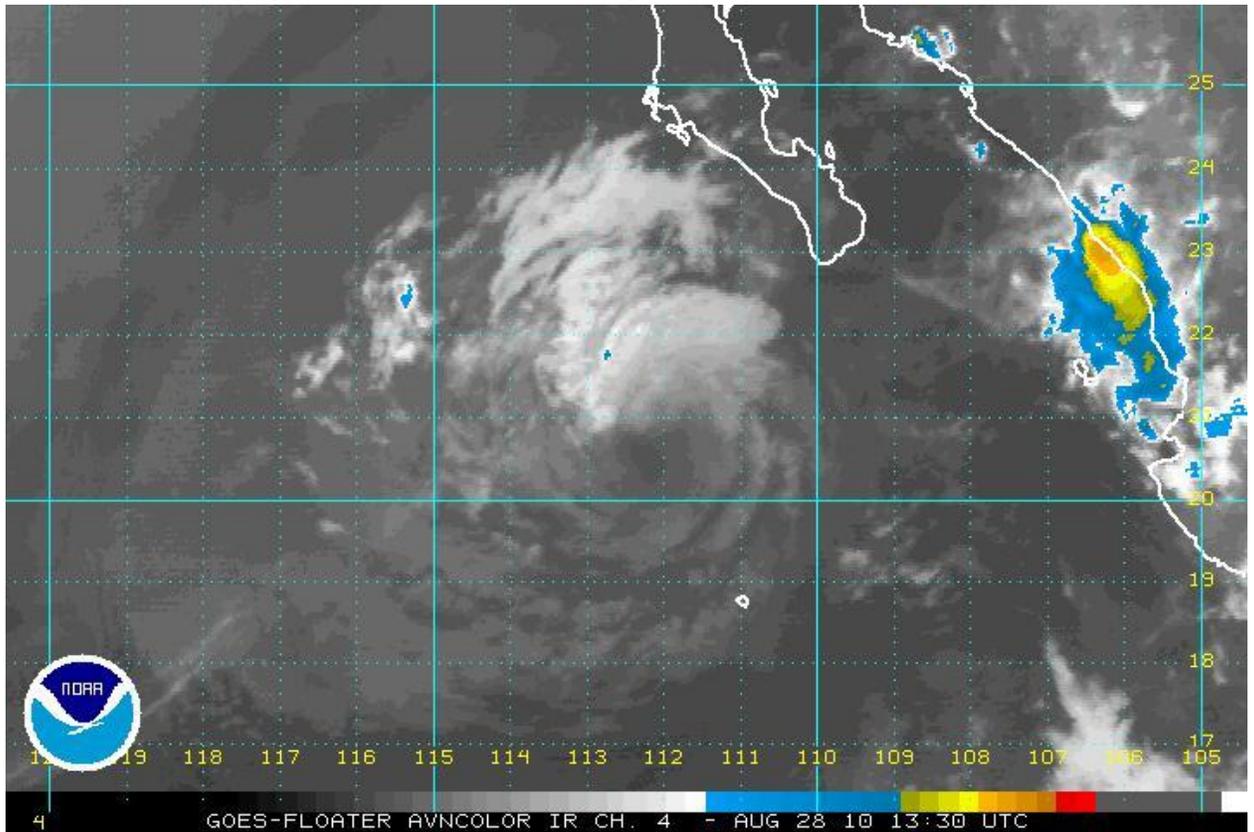
5) A) CIMSS 0900 UTC (A) 850 hPa vorticity



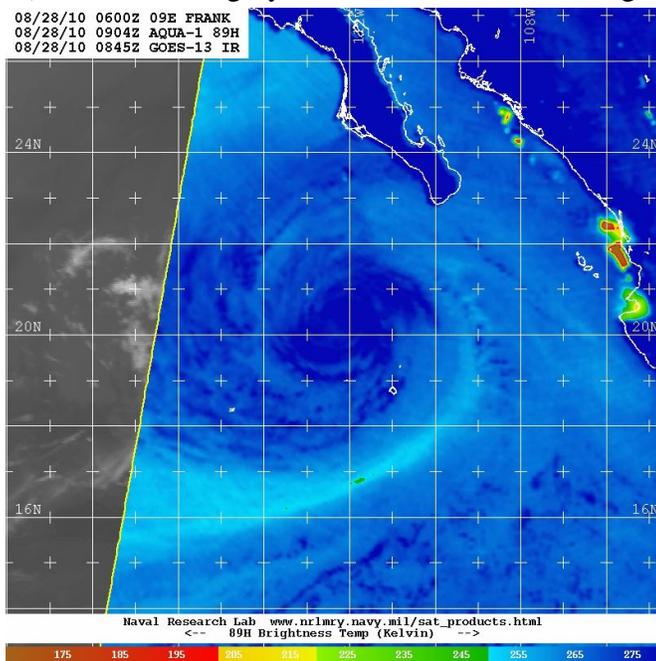
(B) 200 hPa vorticity



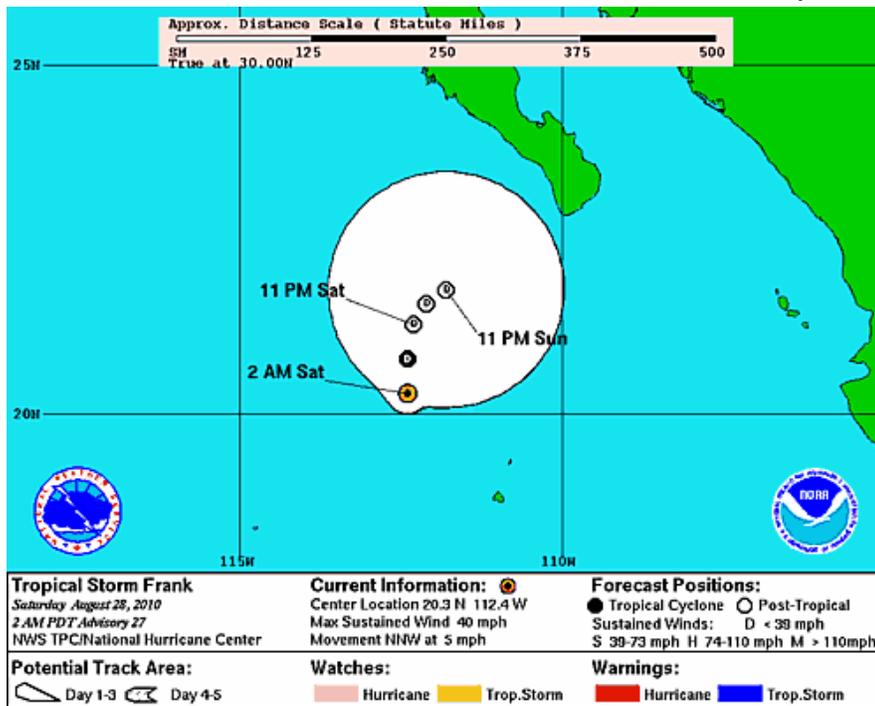
6) A) IR Floater Imagery of Frank at 1330 UTC Aug 28, 2010:



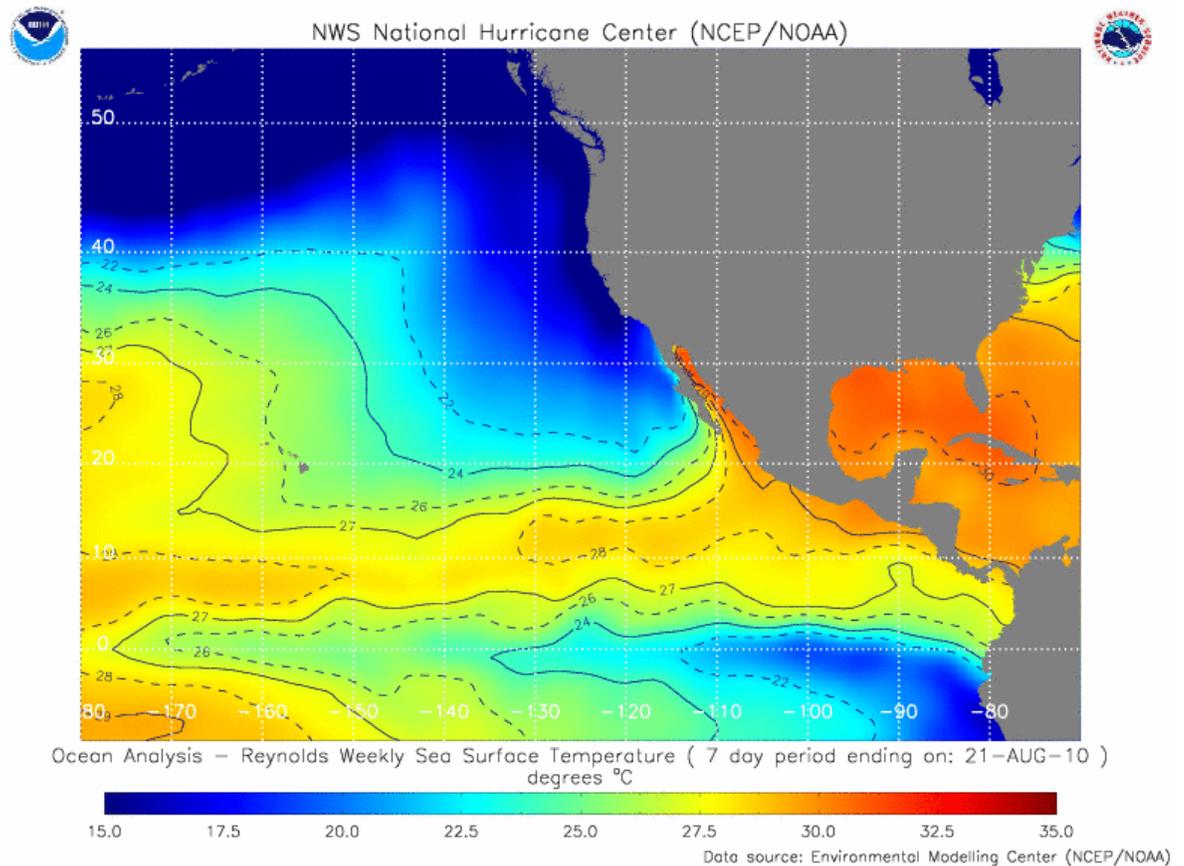
B) AMSR-E Imagery of Frank at 0600 UTC Aug 28:



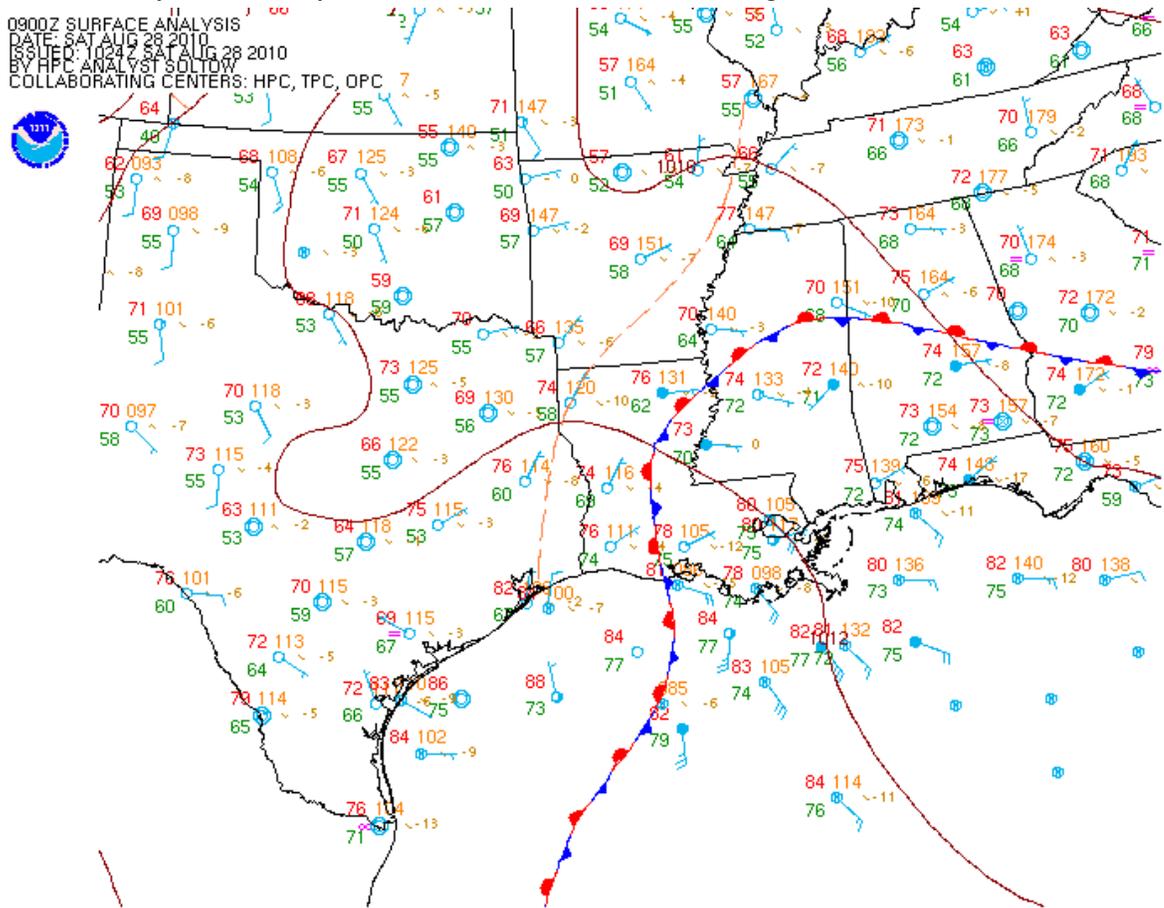
7) A) Track forecast for Frank from the 11am EDT NHC advisory.



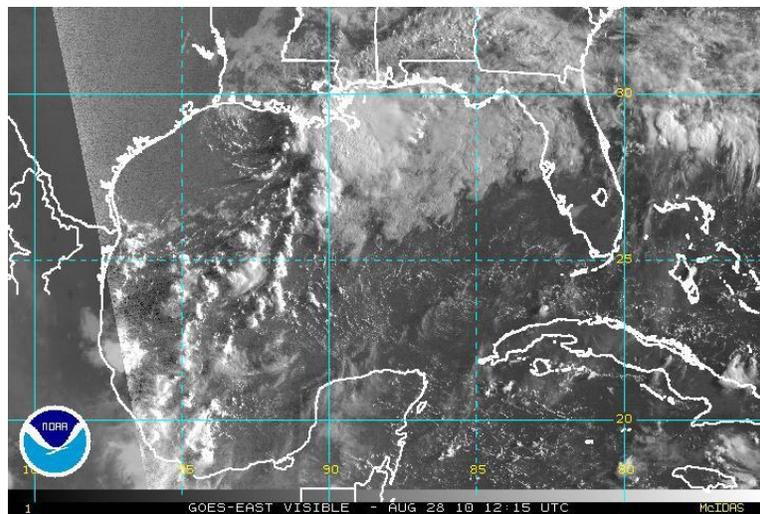
B) The SSTs Frank will encounter:

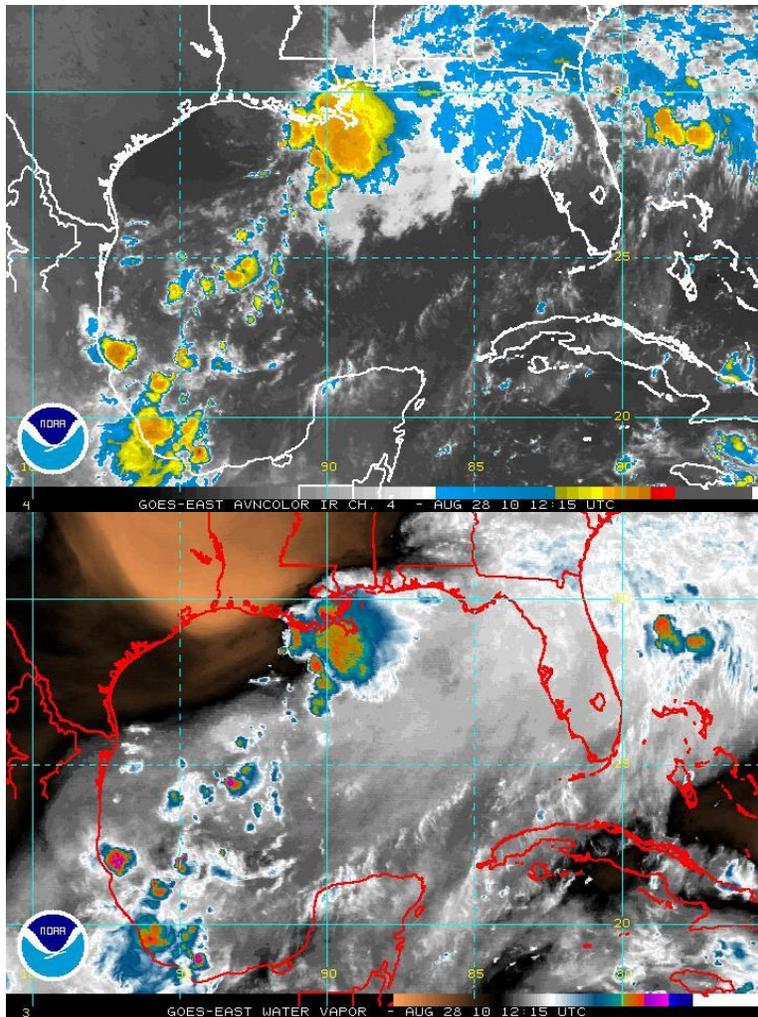


8) Surface analysis issued by NOAA valid at 0900 UTC 28 August



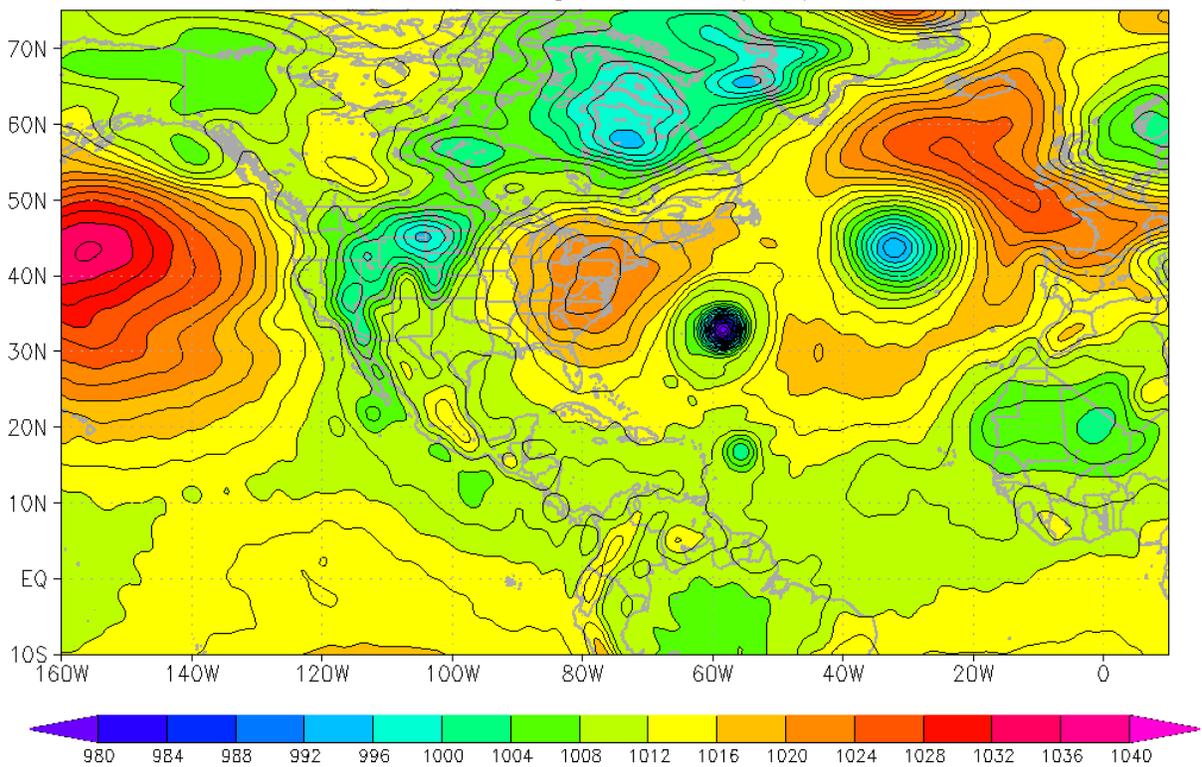
9) Tropical Prediction Center (A) visible, (B) infrared, and (C) water vapor imagery valid at 12:15 UTC 28 August.



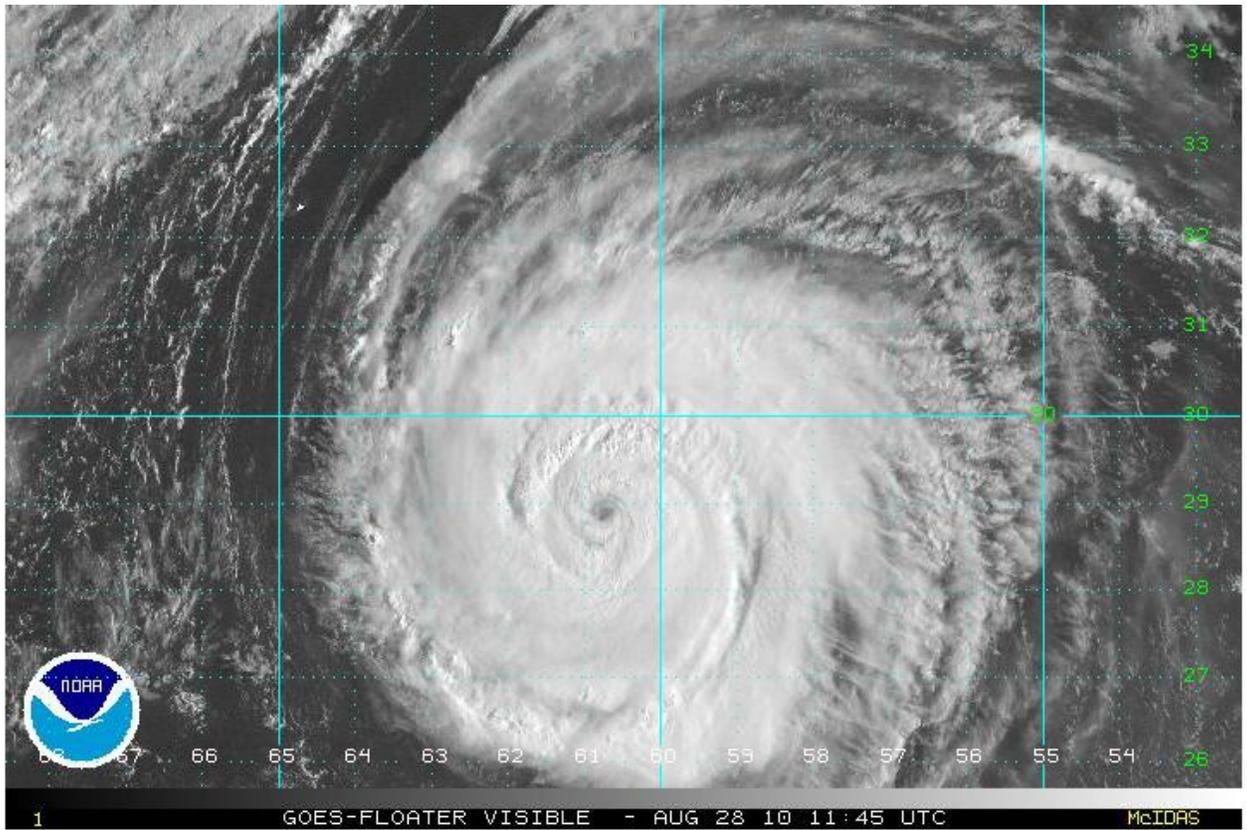


10) GFS 24 h MSLP forecast valid at 0600 UTC 28 August

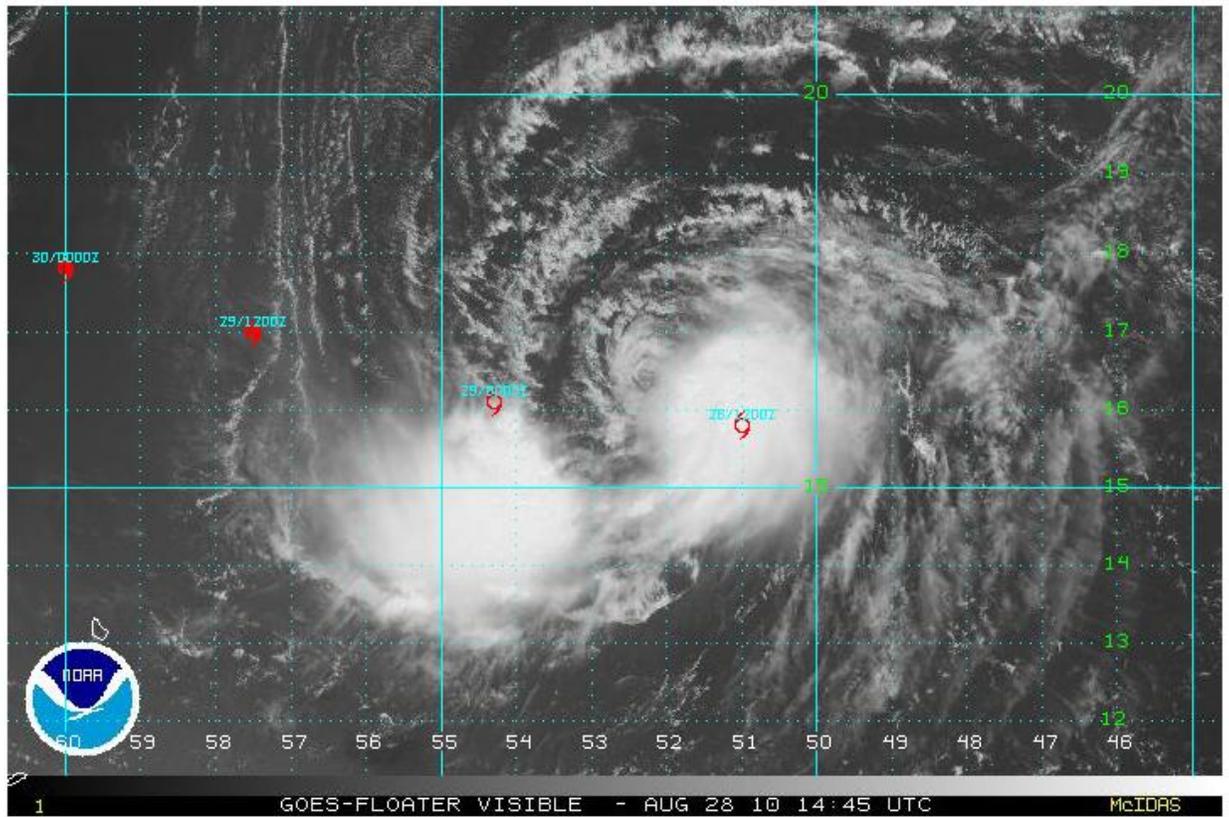
06Z28AUG2010 gfs MSLP (mb) T=24 h



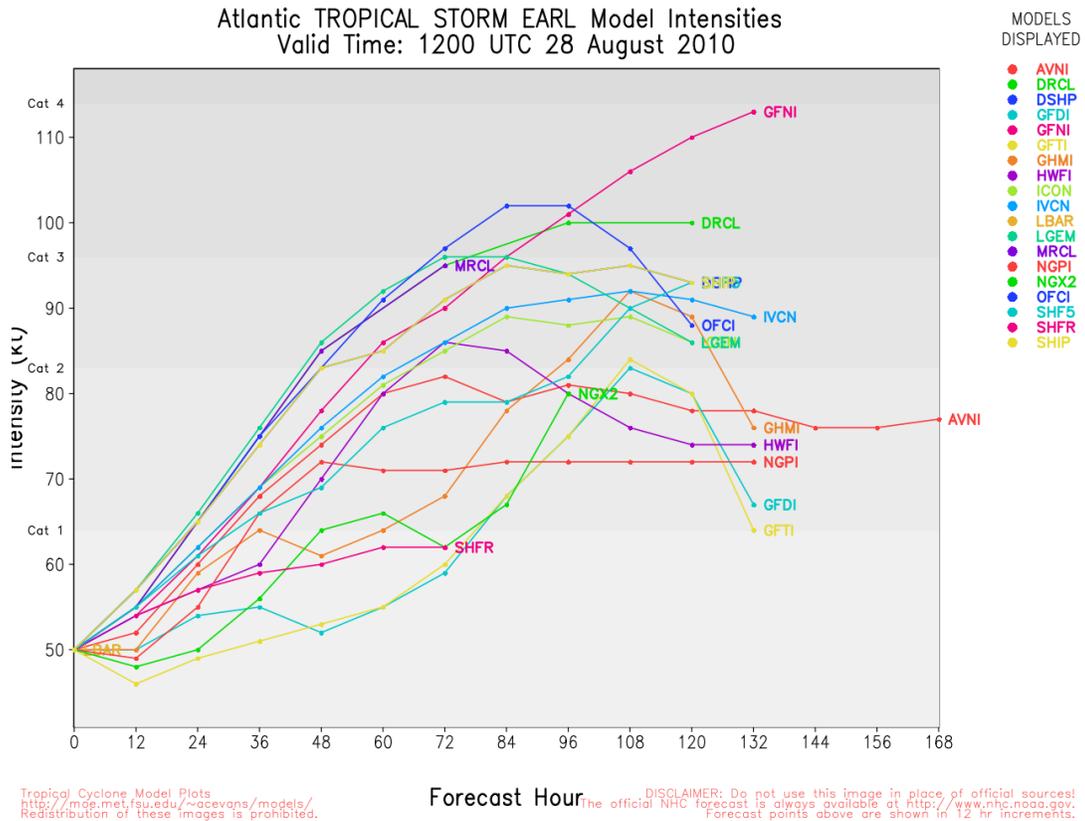
11) Visible Imagery of Hurricane Danielle at 11:45 UTC Aug 28, 2010:



13) Visible Satellite Imagery over TS Earl at 14:45 UTC Aug 28:



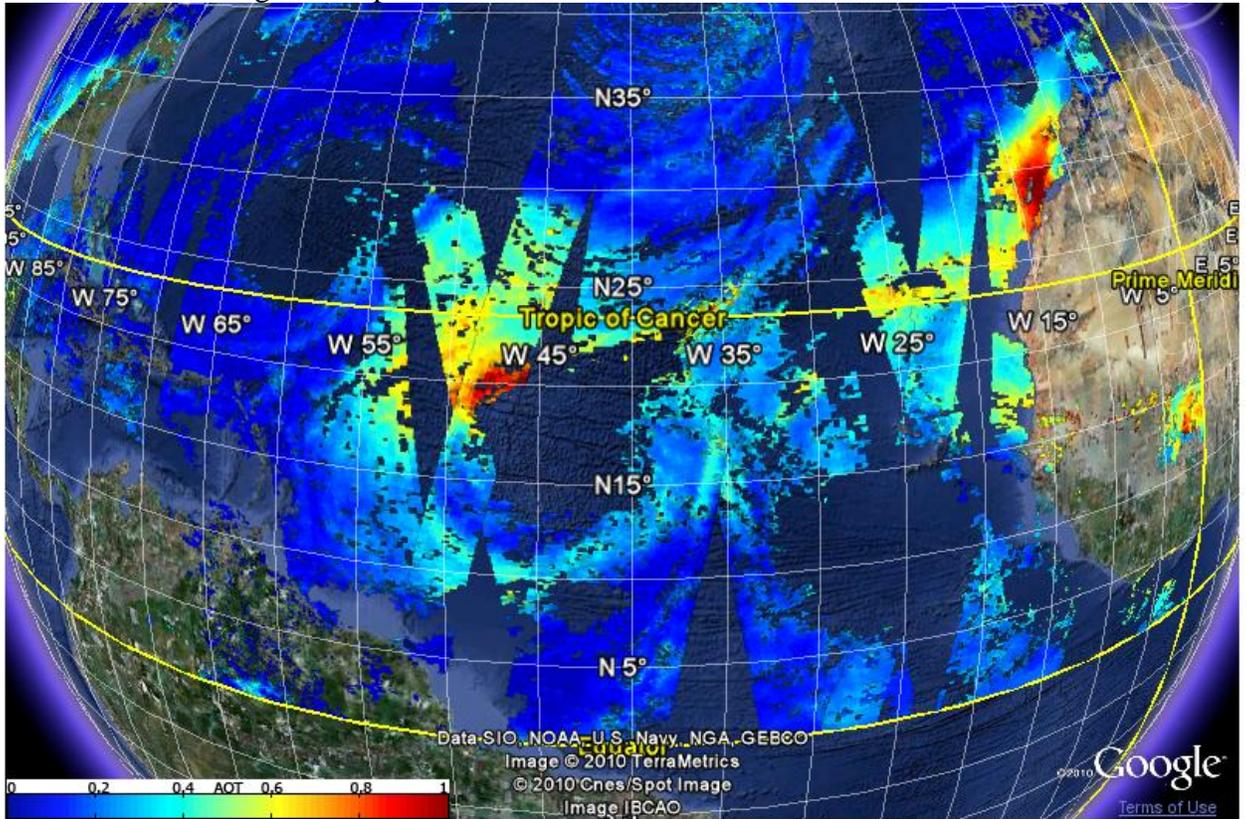
14) Model guidance forecast for TS Earl as of 1200 UTC Aug 28: A) Intensity



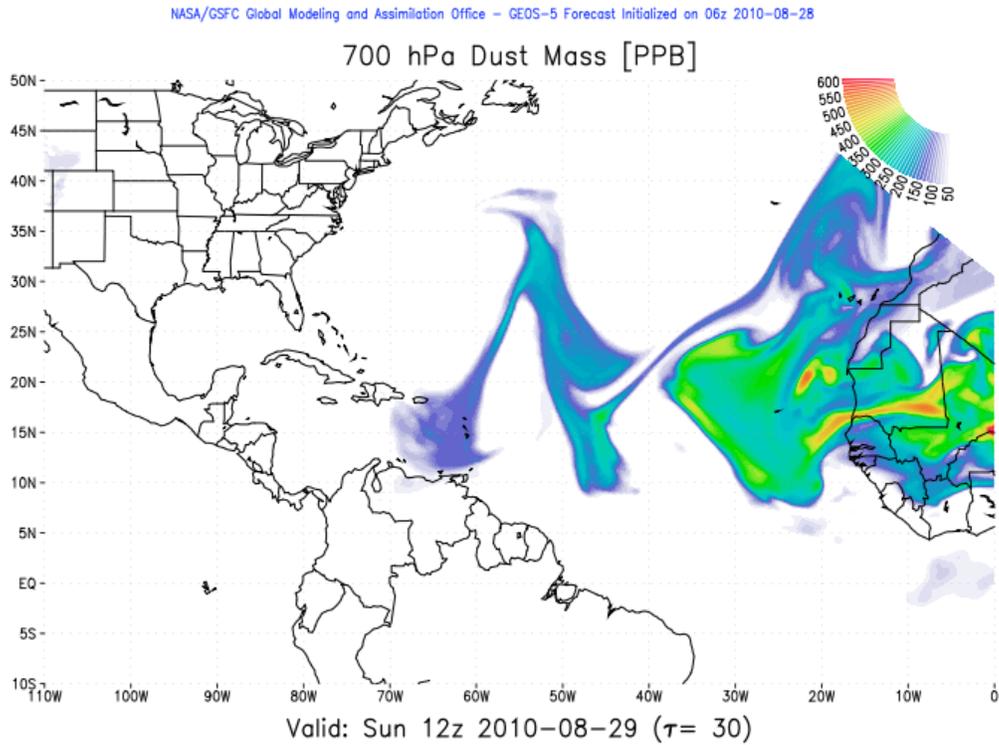
B) Track



15) AOT 0000 UTC Aug 28 composite of Aerosols:

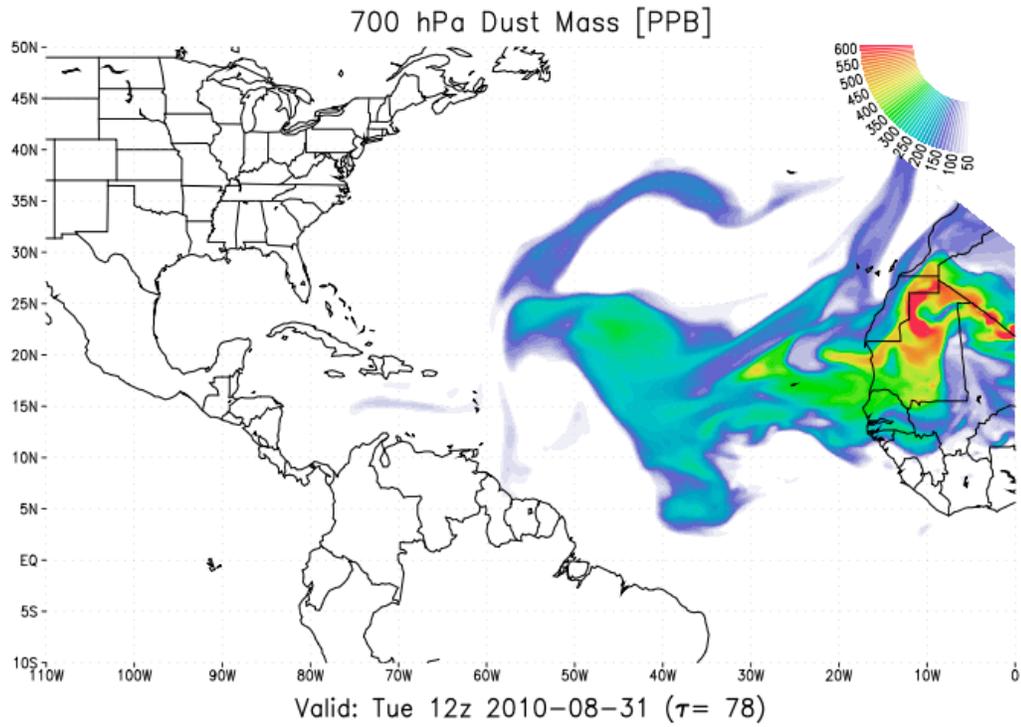


16) A) GEOS-5 700 hPa dust mass forecast valid 1200 UTC 29 August 2010

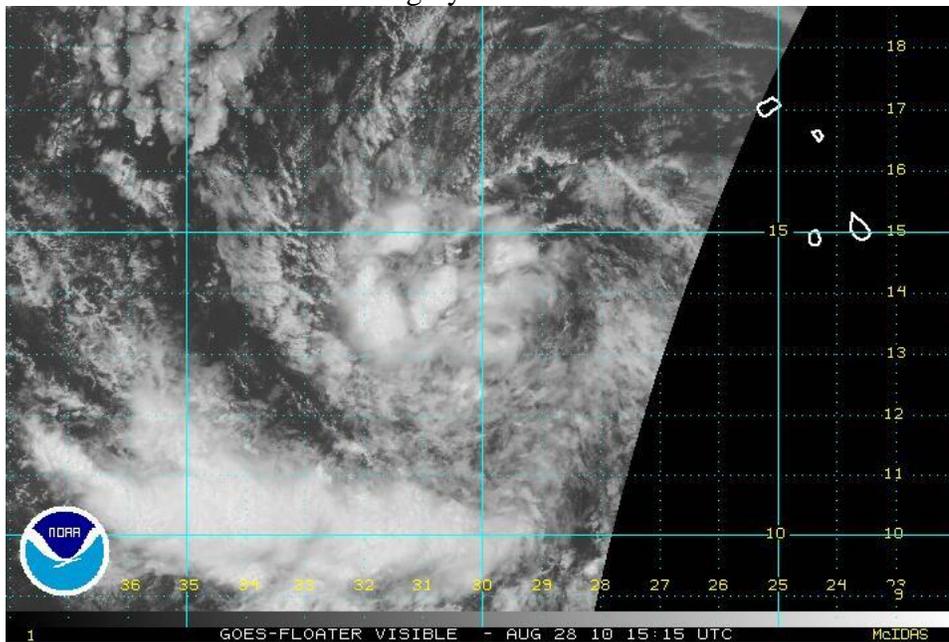


B) GEOS-5 700 hPa dust mass forecast valid 1200 UTC 31 August 2010

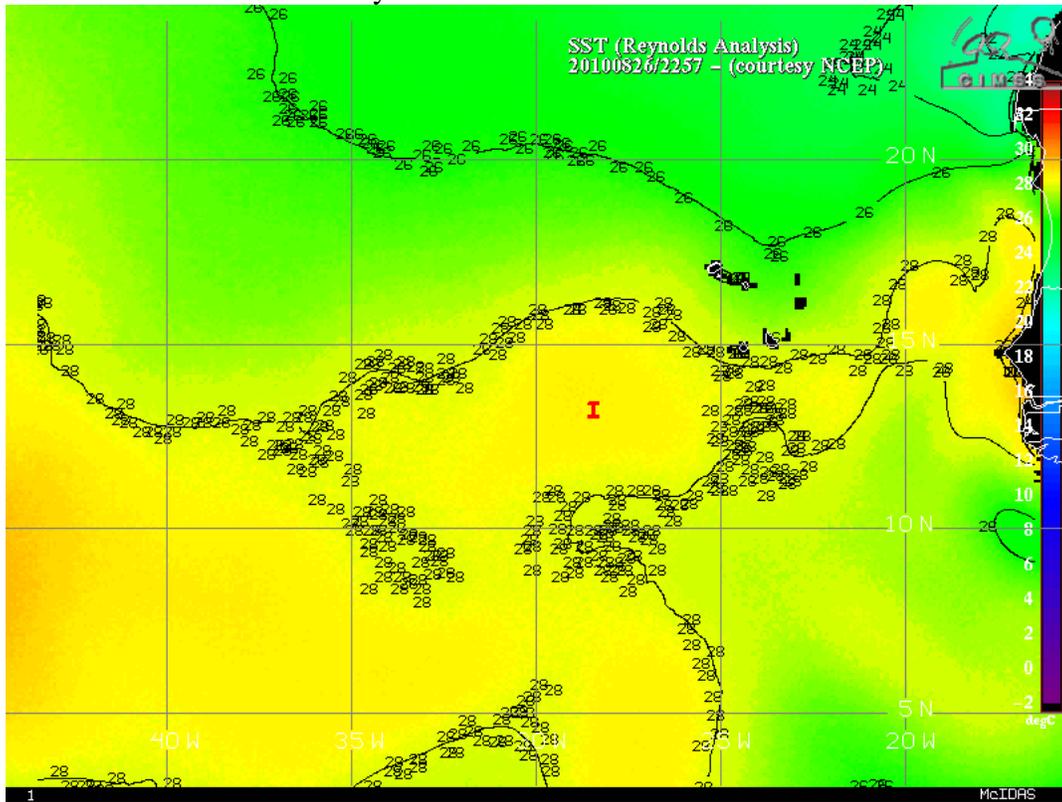
NASA/GSFC Global Modeling and Assimilation Office - GEOS-5 Forecast Initialized on 06z 2010-08-28



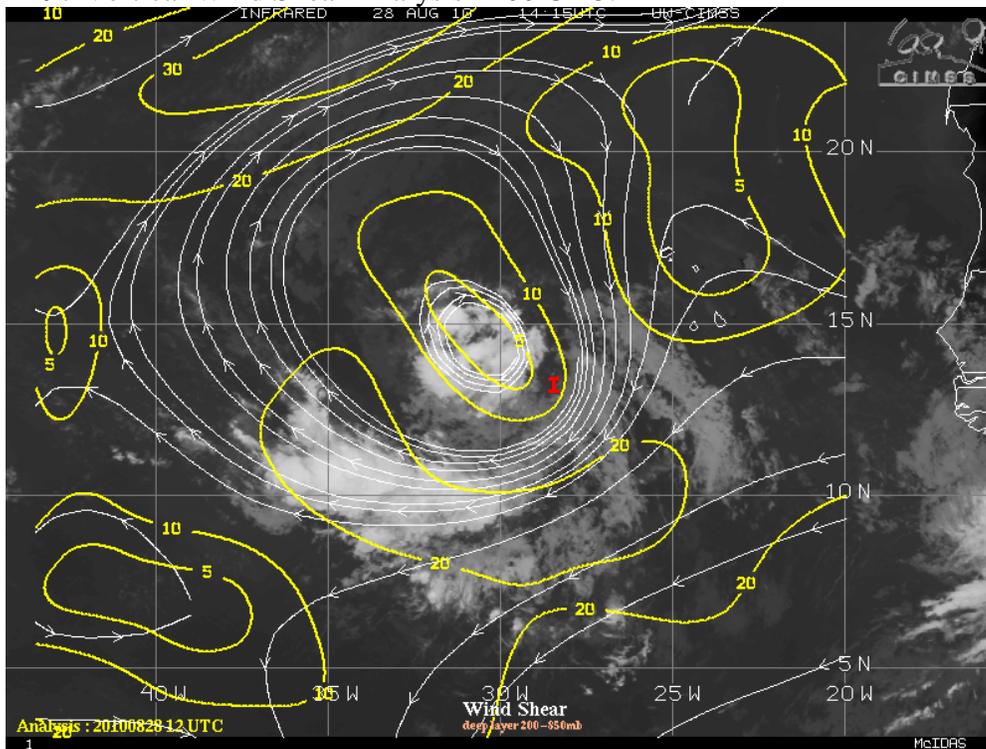
17) 1500 UTC Visible Satellite Imagery of AL97/PGI36L:



18) AL97 location and SST Analysis:



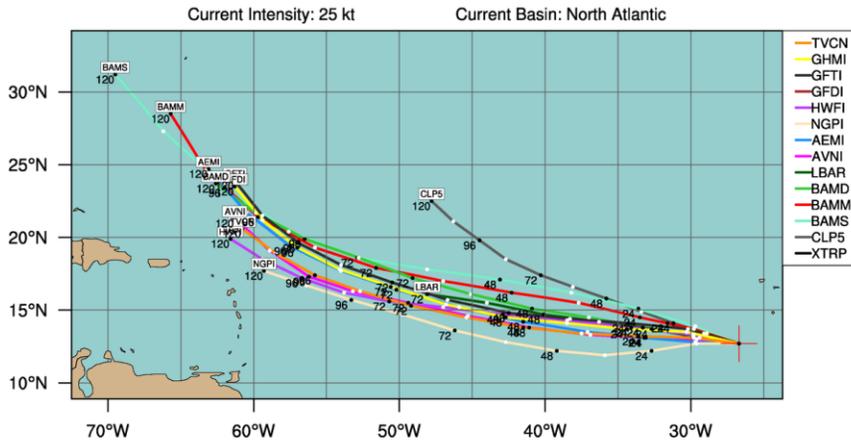
19) AL97 Vertical Wind Shear Analysis 1400 UTC:



20) A) 0600 UTC Track Guidance for AL97:

LOW INVEST (AL97)

Early-cycle track guidance valid 0600 UTC, 28 August 2010



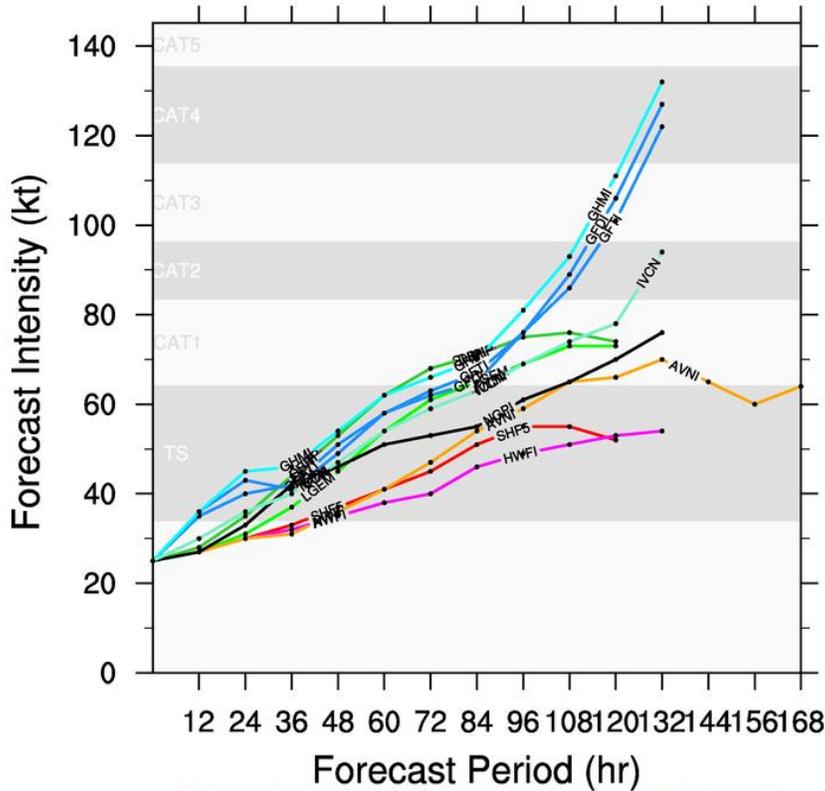
This plot does not display official storm information. Use for information purposes only.
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B) And 0600 UTC Intensity Guidance:

LOW INVEST (AL97)

Early-cycle intensity guidance

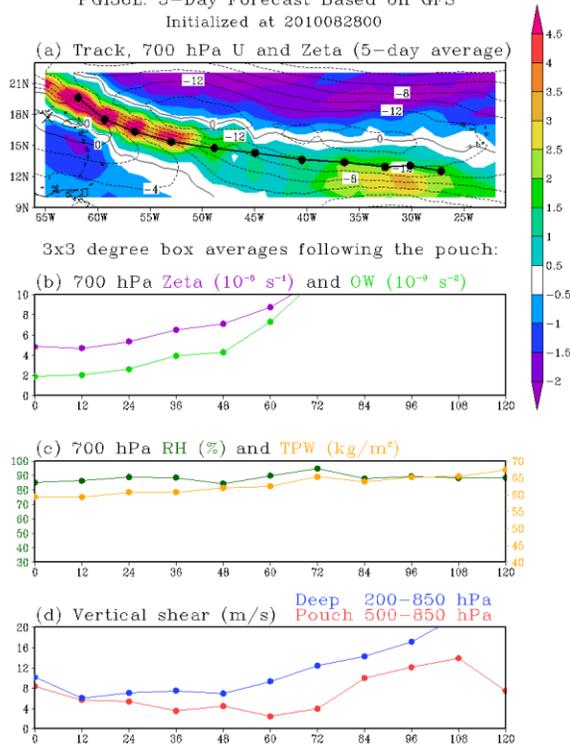
valid 0600 UTC, 28 August 2010



This plot does not display official storm information. Use for information purposes only.
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21) GFS (left) and ECMWF (right) 5-day Pouch Forecast for PGI-36L:

PGI36L: 5-Day Forecast Based on GFS
 Initialized at 2010082800



PGI36L: 5-Day Forecast Based on ECMWF
 Initialized at 2010082800

